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Sand and Gravel

UNITED STATES DEPARTMENT OF THE INTERIOR

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Sand and Gravel

By Valentin V. Tepordei[1]

A total of 896 million short tons of construction sand and gravel was produced in the United States in 1987, the fifth consecutive year of growth. This level of production was a result of the growth that occurred in the last several years in the construction industry, mostly in highway maintenance and construction work, housing, and commercial construction.

Exports of construction sand and gravel decreased slightly in 1987, while imports for consumption increased by 38%, but remained at a very low volume. Domestic apparent consumption of construction sand and gravel in 1987 was 895 million tons.

Production of industrial sand and gravel increased about 2% over that of 1986, but remained below the production levels of 1984 and 1985. The production increase in 1987 was due to a slight improvement in demand for silica sand.

Exports of industrial sand and gravel in 1987 decreased 11%, while imports for consumption increased 18%. Domestic apparent consumption of industrial sand and gravel in 1987 was 27.4 million tons. Apparently, the low value of the U.S. dollar did not have any significant impact on the volume of exports and imports of sand and gravel, construction or industrial.

Table 1.—Salient U.S. sand and gravel statistics[1]

(Thousand short tons and thousand dollars)

	1983	1984	1985	1986	1987
Sold or used:					
Construction sand and gravel:					
Quantity	e655,100	773,900	e800,100	883,000	e896,200
Value	e$1,935,000	$2,244,000	e$2,488,000	$2,747,200	e$3,002,500
Industrial:					
Sand:					
Quantity	26,680	28,680	29,070	26,940	27,280
Value	$329,500	$370,370	$370,730	$354,460	$357,680
Gravel:					
Quantity	537	705	357	484	631
Value	$5,667	$6,844	$3,340	$4,853	$6,424
Total industrial:[2]					
Quantity	26,620	29,380	29,430	27,420	28,010
Value	$335,200	$377,200	$374,070	$359,300	$364,100
Exports:					
Quantity	2,350	3,038	2,379	2,015	1,895
Value	$32,487	$37,981	$31,515	$28,201	$31,786
Imports for consumption:					
Quantity	181	177	327	293	387
Value	$2,666	$2,529	$3,085	$2,426	$3,436

eEstimated.
[1]Puerto Rico excluded from all sand and gravel statistics.
[2]Data may not add to totals shown because of independent rounding.

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Domestic Data Coverage.—Domestic production data for construction and industrial sand and gravel are developed by the Bureau of Mines from voluntary surveys of U.S. producers. Full surveys of construction sand and gravel producers are conducted for even-numbered years only. For odd-numbered years, preliminary surveys are conducted that collect production information on a sample basis in order to generate only annual preliminary estimates at the State level. Industrial sand and gravel producers are surveyed every year. Of the 170 industrial sand and gravel operations surveyed, 155, or 91%, reported to the Bureau of Mines. Their combined production represented 94% of the U.S. total published in table 1. The nonrespondents' production was estimated using mostly employment data. Of the 170 operations, 166, or 98%, were active and 4 were idle.

Legislation and Government Programs.—On April 2, the U.S. Congress enacted the 1987 Surface Transportation Assistance Act that extended the Federal-Aid Highway Program for 5 more years at a total funding level of $68 billion, with annual authorizations ranging between $13.6 and $13.9 billion. On December 31, the Airport Improvement Program (AIP) legislation was enacted that appropriated $1.7 billion funding level for fiscal years 1988 to 1990, and $1.8 billion for fiscal years 1991 and 1992. The total of $8.7 billion represented a 65% increase in funding over the previous AIP program. The program funding levels for fiscal year 1988 were later reduced by the Continuing Resolution (Public Law 100-202) by $0.57 billion for the highway program and by $0.43 billion for the airport program.

Responding to requests made by the industry, the Occupational Safety and Health Administration (OSHA) extended a partial stay to July 21, 1988, for the new provisions of its revised asbestos standards for nonasbestos forms of actinolite, anthophyllite, and tremolite minerals. The stay was issued to allow OSHA time to review additional information and to collect more data, including that on the feasibility of regulating these nonasbestos-form minerals. The extension of the stay was needed because of the range of the affected industries and the lack of mineralogic and exposure data in these industries. The former asbestos standard remains in effect throughout the extension of the stay.

The introduction of the revised OSHA regulations regarding the airborne asbestos standards that include nonasbestos forms of actinolite, anthophyllite, and tremolite would have a significant impact on the aggregates as well as on the construction industries. The resulting costs to society in the form of increased construction costs and disruption of supply of aggregates were considered potentially enormous.

CONSTRUCTION SAND AND GRAVEL

DOMESTIC PRODUCTION

Revised production estimates for 1986 indicate that U.S. output of construction sand and gravel increased 1.5% in 1987. Production increased in New England, West North Central, South Atlantic, Pacific, and Middle Atlantic, and decreased in Mountain, East North Central, East South Central, and West South Central. The Pacific region continued to lead the Nation, followed by East North Central and the Mountain region.

Among the four major geographic regions, the West again led the Nation in the production of construction sand and gravel with 36% of the U.S. total. The Midwest region was next with 27%, and the South was third with 23%. Construction sand and gravel was produced in every State, and the 10 leading States were, in descending order of volume, California, Texas, Michigan, Arizona, Ohio, New York, Florida, Illinois, Alaska, and Washington. Their combined estimated production represented 50% of the national total.

Tarmac PLC of Wolverhampton, United Kingdom, purchased a 60% interest in Lone Star Industries Inc. of Greenwich, CT, aggregates, cement, concrete, and concrete products operations in North Carolina, South Carolina, and Virginia. The purchase agreement included a provision that will allow Tarmac to acquire the remaining 40% interest after January 1, 1990.

J. L. Shiely Co. of St. Paul, MN, acquired the Freidheim Co. of St. Paul, MN, a producer of aggregates, ready-mixed concrete, and concrete blocks in the Minneapolis-St. Paul area. In December, J. L. Shiely agreed to be acquired by English China Clays Ltd. of Cornwall, United Kingdom.

ARC America Corp. of Newport Beach, CA, a subsidiary of Consolidated Gold Fields

Ltd. of the United Kingdom, acquired American Aggregates Corp. of Greenville, OH, a producer of sand and gravel and crushed stone with operations in California, Indiana, Michigan, and Ohio.

Blue Circle Industries PLC of Reading, United Kingdom, through a U.S. subsidiary, acquired Raia Industries Inc., a New Jersey aggregates and ready-mixed concrete producer with extensive aggregates reserves in the State.

On May 12, 1987, following the recommendation made by the association's board of directors, the members of the National Sand and Gravel Association (NSGA) approved dissolving the 71-year-old organization and reinstating it as the National Aggregates Association. As the reserves of available sand and gravel continue to diminish, more and more NSGA members are becoming crushed stone producers as well. Concern for the long-term future of the association and the sand and gravel industry convinced its members to open NSGA membership to all aggregate producers by amending the bylaws and changing the name of the organization.

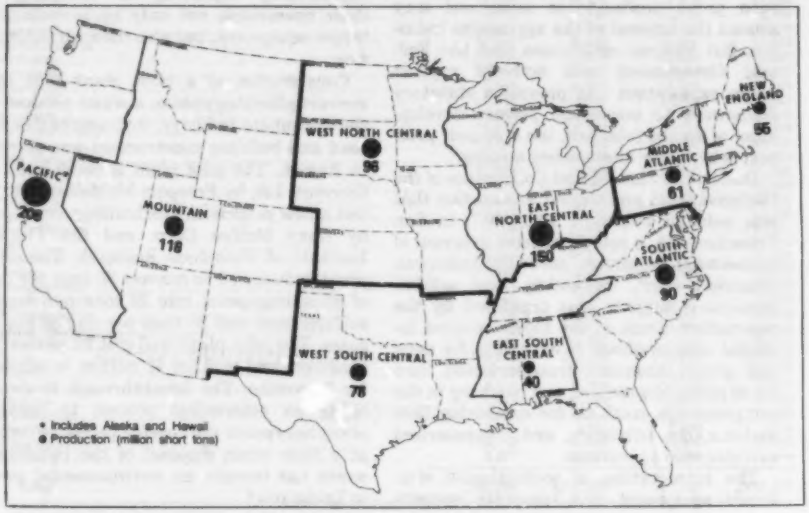

Figure 1.—Production of construction sand and gravel in the United States in 1987, by geographic region.

FOREIGN TRADE

Exports.—Exports of construction sand decreased 12% to 593,000 tons. Canada was the major destination, receiving 81% of the total, while Mexico received 9%. Exports of construction gravel increased by 11% to 544,000 tons, 91% of which went to Canada, and 3% to the Leeward Islands.

Imports.—Imports of construction sand and gravel increased 38% to 283,000 tons, 70% of which came from Canada and 14% from Antigua.

TECHNOLOGY

In response to a joint request from the House Committee on Merchant Marine and Fisheries and the House Committee on Science, Space, and Technology of the U.S. Congress, the Office of Technology Assessment evaluated the near-term development potential of selected offshore minerals within the U.S. Exclusive Economic Zone (EEZ). The report examined the current knowledge about the hard mineral resources within the EEZ, explored the economic and

security potential of seabed resources, assessed the technologies available to explore and mine those resources, identified the issues facing the Congress and the executive branch of the Government, and presented options for dealing with these issues. The report concluded that progress in seabed mining would require Government commitment to ocean exploration, resolution of data secrecy problems, an improved demand for some minerals, and perhaps new legislation. The report ranked sand and gravel first among six minerals with development potential, and indicated that around high-growth, high-density areas in the Northeast and the west coast of the United States, marine sand and gravel may soon prove profitable to mine and may attract the interest of the aggregates industry. But without assurances that the Federal Government will actively support ocean exploration and provide a statutory framework to encourage private development of seabed minerals, the economic prospect is bleak for most seabed mining.[2]

During the 71st Annual Convention of the National Sand and Gravel Association that was held on February 8-11, 1987, in San Francisco, CA, a comprehensive program of educational seminars covering technical, financial, legal, marketing, and self-improvement subjects was organized by the association. Some of the topics covered included new methods of exploring for sand and gravel, economic transportation from pit to plant, dispatching and batching in the computer age, methods for measuring fleet maintenance efficiency, and computerized maintenance operations.

The introduction of sophisticated electronic equipment and computer systems for improved efficiency of mining and processing operations continued in the sand and gravel industry. Computer programs are used for plant design, including selection of flow diagrams, types and sizes of crushing and screening equipment, and to produce blueprints of plant drawings. Operations such as blasting, excavation, crushing and screening, loading, and hauling have advanced into highly technical disciplines that use a wide range of automated equipment. Computerized systems that provide a high degree of plant automation in day-to-day operation, quality control, and truck dispatch systems are being used more and more by producers. Most producers are significantly improving the efficiency of their operations, not only by investing in larger equipment, but also through automation.

Construction of a pilot plant that will convert phosphogypsum, a waste product of the phosphate industry, into aggregates for road and building construction was started in August. The pilot plant is being built in Convent, LA, by Freeport-McMoRan Inc. to test a new proprietary technology developed by Davy McKee Corp. and the Florida Institute of Phosphate Research. The pilot plant is designed to convert 35 tons per day of phosphogypsum into 29 tons per day of sulfuric acid and 25 tons per day of aggregates. The pilot plant will cost $2 million to construct and another $1 million to operate for 6 months. The breakthrough in developing an economical process to convert phosphogypsum into useful products comes at a time when disposal of the byproduct waste has become an environmental issue in Louisiana.[3]

Table 2.—Construction sand and gravel sold or used in the United States, by geographic region

Geographic region	1986				1987			
	Quantity (thousand short tons)	Percent of total	Value (thousands)	Percent of total	Quantity[e] (thousand short tons)	Percent of total	Value[e] (thousands)	Percent of total
Northeast:								
New England	50,546	5	$154,857	6	55,300	6	$189,400	6
Middle Atlantic	60,544	7	226,374	8	61,400	7	247,000	8
Midwest:								
East North Central	151,742	17	421,712	15	150,300	17	457,700	15
West North Central	88,444	10	205,825	8	95,300	11	255,000	9
South:								
South Atlantic	83,992	10	276,964	10	90,100	10	297,300	10
East South Central	40,415	5	115,193	4	40,000	4	120,700	4
West South Central	92,791	11	307,573	11	78,100	9	270,300	9
West:								
Mountain	117,972	13	356,615	13	117,700	13	390,800	13
Pacific	196,556	22	682,060	25	207,800	23	769,300	25
Total[1]	883,000	100	2,747,200	100	896,200	100	2,992,500	100

[e]Estimated.
[1]Data may not add to totals shown because of independent rounding.

Table 3.—Construction sand and gravel sold or used in the United States, by State

(Thousand short tons and thousand dollars)

State	1996		1997[e]	
	Quantity	Value	Quantity	Value
Alabama	10,781	39,897	10,200	35,600
Alaska	27,792	61,964	27,200	73,400
Arizona	40,448	140,004	38,100	141,300
Arkansas	6,571	26,299	7,200	23,900
California	128,467	496,458	141,600	561,300
Colorado	20,223	70,095	22,967	84,300
Connecticut	7,254	25,954	8,400	37,900
Delaware	1,547	4,158	2,300	6,400
Florida	28,232	67,888	30,000	74,300
Georgia	8,126	23,222	9,000	26,900
Hawaii	605	2,686	700	3,500
Idaho	5,708	14,920	7,200	20,000
Illinois	27,397	82,523	28,200	90,300
Indiana	19,642	61,232	18,900	65,200
Iowa	14,511	40,418	19,000	62,800
Kansas	15,609	33,721	15,600	37,300
Kentucky	7,194	16,986	7,100	16,200
Louisiana	14,292	46,134	12,200	43,600
Maine	8,572	22,843	8,600	22,100
Maryland	18,173	86,925	19,600	92,900
Massachusetts	19,200	69,464	21,300	75,300
Michigan	42,514	91,896	42,800	105,300
Minnesota	24,055	53,116	25,200	67,400
Mississippi	15,080	42,809	14,700	47,000
Missouri	9,746	34,065	10,900	30,400
Montana	8,066	19,201	6,800	18,800
Nebraska	9,675	23,912	10,300	28,300
Nevada	12,197	35,692	10,600	30,700
New Hampshire	5,418	26,089	9,100	33,200
New Jersey	13,900	53,746	15,200	61,200
New Mexico	8,471	25,962	8,600	31,000
New York	31,172	103,748	31,400	112,900
North Carolina	7,543	23,127	8,800	30,100
North Dakota	5,135	10,741	4,900	10,200
Ohio	36,806	125,747	36,400	136,900
Oklahoma	10,366	34,585	10,500	34,200
Oregon	13,441	42,597	13,000	42,200
Pennsylvania	15,573	66,880	14,800	72,900
Rhode Island	2,989	8,252	2,700	10,900
South Carolina	7,200	19,783	7,500	19,500
South Dakota	9,713	19,853	9,600	19,100
Tennessee	7,360	24,592	7,300	25,900
Texas	89,562	209,835	48,200	178,600
Utah	16,453	39,763	21,000	86,700
Vermont	4,834	11,226	4,700	10,800
Virginia	11,670	45,488	12,100	43,400
Washington	26,842	76,267	25,300	78,900
West Virginia	1,501	5,365	1,000	3,200
Wisconsin	24,913	59,325	23,900	57,000
Wyoming	3,277	10,977	2,600	9,000
Total[1]	883,000	2,747,200	896,200	3,002,500

[e]Estimated.

[1]Data may not add to totals shown because of independent rounding.

Table 4.—U.S. exports of construction sand and gravel, by country

(Thousand short tons and thousand dollars)

Country	Construction sand		Gravel	
	Quantity	F.a.s. value[1]	Quantity	F.a.s. value[1]
1986				
Bahamas	--	--	11	86
Canada	646	2,686	392	1,254
French West Indies	--	--	26	144
Germany, Federal Republic of	(2)	77	(2)	8
Japan	3	489	--	--
Leeward and Windward Islands	--	--	4	82
Mexico	12	514	50	524
Netherlands Antilles	(2)	11	9	120
Peru	5	264	--	--
Saudi Arabia	(2)	53	(2)	17
Trinidad and Tobago	3	152	(2)	39
Other	5	1,280	(2)	106
Total	674	5,446	492	2,332
1987				
Argentina	6	667	--	--
Australia	1	69	--	--
Brazil	6	43	--	--
Canada	480	2,930	496	1,497
Colombia	2	16	--	--
French West Indies	8	83	12	173
Japan	3	185	--	--
Leeward and Windward Islands	2	14	17	228
Mexico	55	765	10	768
Netherlands	3	647	--	--
Netherlands Antilles	1	23	4	87
Panama	8	192	--	--
Peru	5	252	--	--
Saudi Arabia	(2)	13	--	--
Taiwan	5	68	--	--
Trinidad and Tobago	1	33	(2)	9
United Kingdom	1	96	3	37
Venezuela	1	317	--	--
Other	4	1,143	1	126
Total[3]	593	7,610	544	2,923

[1]Value of material at U.S. port of export; based on transaction price, including all charges incurred in placing material alongside ship.
[2]Less than 1/2 unit.
[3]Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census.

Table 5.—U.S. imports for consumption of construction sand and gravel, by country

(Thousand short tons and thousand dollars)

Country	1986		1987	
	Quantity	C.i.f. value[1]	Quantity	C.i.f. value[1]
Antigua	34	103	41	287
Australia	--	--	2	470
Bahamas	--	--	13	73
British Virgin Islands	5	62	3	59
Canada	157	707	198	945
Costa Rica	--	--	19	87
Japan	4	88	--	--
Spain	(2)	3	--	--
Taiwan	--	--	2	23
Other	5	449	5	403
Total	205	1,412	283	2,367

[1]Value of material at U.S. port of entry; based on purchase price and includes all charges (except U.S. import duties) in bringing material from foreign country to alongside carrier.
[2]Less than 1/2 unit.

Source: Bureau of the Census.

INDUSTRIAL SAND AND GRAVEL

DOMESTIC PRODUCTION

The total output of industrial sand and gravel increased by approximatly 2% to 28 million tons. The Midwest major geographic region continued to lead the Nation with about 41% of the U.S. total, followed by the South with about 36% and the West with 12%. Two major geographic regions, the Midwest and the South, produced 77% of the total U.S. industrial sand output. Compared with 1986, the output of industrial sand and gravel increased 7% in the South, 2% in the West, and 1% in the Midwest, but decreased 7% in the Northeast.

Based on the 1985 census estimations on population, 1987 U.S. per capita industrial sand and gravel production was 0.12 ton. Per capita production by major geographic region was 0.19 ton in the Midwest, followed by the South with 0.12 ton, the West with 0.07 ton, and the Northeast with 0.06 ton.

The five leading States in the production of industrial sand and gravel in 1987, in descending order of volume, were Illinois, Michigan, California, New Jersey, and Florida. Their combined production represented 48% of the national total. Of the major producing States, significant increases were recorded in Florida, 28%, and Texas, 16%, while production decreased significantly in Michigan, 16%, New Jersey, 10%, and California, 5%.

The Bureau of Mines canvassed 94 producers of industrial sand and gravel with 166 active operations. About 73% of the industrial sand and gravel was produced by 43 operations, each with an annual production of more than 200,000 tons. The 10 leading producers of industrial sand and gravel were, in descending order of tonnage, Unimin Corp., U.S. Silica Co., The Morie Co. Inc., Fairmount Minerals Ltd., Standard Sand & Silica Co., Badger Mining Corp., Oglebay Norton Co., Construction Aggregates Corp., and Owens-Illinois Inc. Their combined production, from 61 operations, represented 74% of the U.S. total.

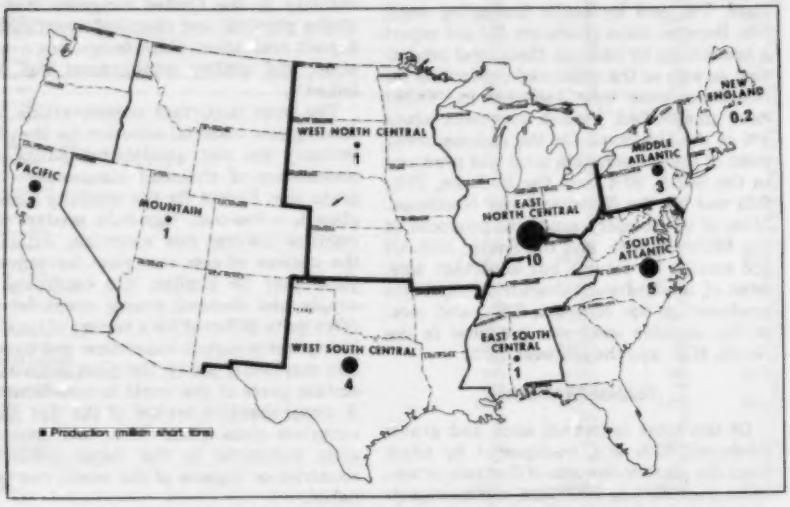

Figure 2.—Production of industrial sand and gravel in the United States in 1987, by geographic region.

U.S. Silica, a subsidiary of Pacific Coast Resources Corp. of Los Angeles, CA, purchased Warrior Sand Co. of Hurtsboro, AL, a major producer of foundry sands in the South. This acquisition extended its network of plants in the United States to 17 industrial sand operations in 14 States.

The top two companies, Unimin and U.S. Silica, hold a large proportion of the industrial sand production capacity in the United States.

California Silica Products Co., a subsidiary of Oglebay Norton of Cleveland, OH, announced the completion of an expansion to its silica sand operation at San Juan Capistrano, CA. The plant, which was designed to produce glass sand, will also supply some new markets, including the construction industry.

CONSUMPTION AND USES

Sand and gravel production reported by producers to the Bureau of Mines is actually material sold or used by the companies or their customers. Stockpiled material is not reported until it is consumed or sold.

Of the 28 million tons of industrial sand and gravel sold or used, 42% was consumed as glassmaking sand and 25% as foundry sand. Other important uses were abrasive sand, 7%, and hydraulic fracturing sand, 5%. Because some producers did not report a breakdown by end use, their total production as well as the estimated production for nonrespondents were included in "Other uses, unspecified," which represent about 8% of the U.S. total. On the regional level, most of the glassmaking sand was produced in the South, 39%, and the Midwest, 27%, followed by the West and the Northeast. Most of the foundry sand was produced in the Midwest, 73%, and the South, 18%. Of the smaller by volume but important uses, most of the hydraulic fracturing sand was produced in the Midwest, 73%, and most of the abrasive sand was produced in the South, 46%, and the Midwest, 28%.

TRANSPORTATION

Of the total industrial sand and gravel produced, 63% was transported by truck from the plant to the site of first sale or use, down from 66% in 1986; 34% was transported by rail, up from 31% in 1986; and 3% by waterway, unchanged from 1986. Because most of the producers did not report shipping distances or cost per ton per mile, no transportation cost data were available.

PRICES

The average value, f.o.b. plant, of U.S. industrial sand and gravel decreased slightly to $13.00 per ton. Average unit values for industrial sand and industrial gravel were $13.06 and $10.18 per ton, respectively. Nationally, industrial sand used as fillers for rubber, paint, and putty, etc., had the highest value per ton, $57.62, followed by silica sand used in ceramics, $38.25, fiberglass (ground), $30.49, silica flour, $28.72, and scouring cleansers, $25.21.

FOREIGN TRADE

Exports.—Exports of industrial sand decreased 11% to 758,000 tons, while the value increased 4% to $21.3 million. Of this, 79% went to Canada, 7% went to Mexico, and 7% went to several European countries.

Imports.—Imports for consumption of industrial sand increased 18% to 104,000 tons valued at $1.1 million. Of this, 52% came from Antigua, 18% from the Bahamas, and 17% from Australia.

TECHNOLOGY

The technology of glass manufacturing is changing almost continuously. These changes require improvements in the processing of raw silica sands to meet the new specifications imposed by the changing technology. A review of the glass sand industry in the United Kingdom that includes physical and chemical specification, deposit evaluation, plant design, plant operation, and quality management was published.[4]

The most important considerations concerning raw material selection for the glass industry are cost, availability, purity and consistency of chemical composition, and grain size. Except for the specialty glasses, glass is a low-cost, high-bulk product that requires low-cost raw materials. Although the choices of raw materials for common glass may be similar, the conditions of supply and demand among countries are often quite different for a variety of reasons. Using technological innovation and aggressive marketing policy, the glass industry in certain parts of the world is consolidating. A comprehensive review of the flat glass, container glass, glass fibers, and specialty glass industries in the major producing countries or regions of the world was published.[5]

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[1]Physical scientist, Branch of Industrial Minerals.

[2]U.S. Congress. Marine Minerals: Exploring Our New Ocean Frontier. Off. Technol. Assess., OTA-O-342, 1987, 349 pp.

[3]Rukavina, M. Phosphate Industry Hopes To Turn Phosphogypsum Waste Into Aggregates. Rock Prod., v. 90, No. 9, Sept. 1987, pp. 17, 78.

[4]Kirby, C., and Lavender, M. Developments in the Glass Sands Supply Industry. Ind. Miner. (London), No. 242, Nov. 1987, pp. 55-62.

[5]O'Driscoll, M. Glass Markets—Added Value Impetus. Ind. Miner. (London), No. 239, Aug. 1987, pp. 33-62.

Table 6.—Industrial sand and gravel sold or used in the United States, by geographic region

Geographic region	1986				1987			
	Quantity (thousand short tons)	Percent of total	Value (thousands)	Percent of total	Quantity (thousand short tons)	Percent of total	Value (thousands)	Percent of total
Northeast:								
New England	129	1	$2,541	1	161	1	$3,921	1
Middle Atlantic	2,089	11	41,132	11	2,939	10	38,155	10
Midwest:								
East North Central	9,990	36	116,699	32	9,981	35	105,815	29
West North Central	1,340	5	16,011	4	1,516	5	20,263	6
South:								
South Atlantic	5,432	20	71,292	20	5,545	20	75,505	21
East South Central	945	3	9,196	3	1,098	4	10,719	3
West South Central	3,161	11	42,929	12	3,545	13	49,065	13
West:								
Mountain	694	3	9,251	3	947	3	13,980	4
Pacific	2,621	10	49,207	14	2,585	9	46,658	13
Total[1]	27,420	100	359,300	100	28,010	100	364,100	100

[1]Data may not add to totals shown because of independent rounding.

Table 7.—Industrial sand and gravel sold or used in the United States, by State

(Thousand short tons and thousand dollars)

State	1986		1987	
	Quantity	Value	Quantity	Value
Alabama	425	3,388	580	5,025
Arizona	W	W	W	W
Arkansas	460	3,975	595	5,147
California	2,364	44,813	2,341	41,472
Colorado	W	W	W	W
Connecticut	W	W	W	W
Florida	1,467	14,930	1,884	19,713
Georgia	W	W	W	W
Idaho	W	W	W	W
Illinois	4,699	52,183	4,345	45,547
Indiana	193	1,490	230	1,857
Kansas	132	1,155	127	1,400
Kentucky	W	W	W	W
Louisiana	256	4,225	289	3,997
Maryland	W	W	W	W
Massachusetts	45	739	56	922
Michigan	3,343	29,490	2,792	22,451
Minnesota	W	W	W	W
Mississippi	W	W	W	W
Missouri	517	6,220	622	7,786
Montana	W	W	W	W
Nebraska	W	W	W	W
Nevada	518	W	578	W
New Jersey	2,341	29,978	2,112	27,872
New York	89	1,164	58	651
North Carolina	1,464	16,656	1,184	15,329
North Dakota	W	W	W	W
Ohio	1,221	21,183	1,249	21,292
Oklahoma	1,203	16,454	1,343	17,978
Pennsylvania	688	10,091	W	W
Rhode Island	22	143	W	W
South Carolina	800	14,061	844	15,188
Tennessee	488	5,523	W	W
Texas	1,302	18,274	1,509	22,843
Utah	6	123	6	111
Virginia	W	W	W	W
Washington	W	W	294	5,186
West Virginia	W	W	W	W
Wisconsin	1,194	12,299	1,314	15,168
Other	2,927	50,768	3,945	68,545
Total[1]	27,420	359,300	28,010	364,100

W Withheld to avoid disclosing company proprietary data; included with "Other."
[1]Data may not add to totals shown because of independent rounding.

Table 8.—Industrial sand and gravel production in the United States in 1987, by size of operation

Size range	Number of operations	Percent of total	Quantity (thousand short tons)	Percent of total
Less than 25,000	41	24.7	270	1.3
25,000 to 49,999	28	16.9	1,023	3.7
50,000 to 99,999	28	16.9	2,179	7.8
100,000 to 199,999	26	15.7	3,851	13.7
200,000 to 299,999	8	4.8	1,903	6.8
300,000 to 399,999	9	5.4	3,117	11.1
400,000 to 499,999	8	4.8	3,528	12.7
500,000 to 599,999	8	4.8	4,315	15.4
600,000 to 699,999	5	3.0	3,369	12.0
700,000 and over	5	3.0	4,354	15.5
Total	166	100.0	[1]28,010	100.0

[1]Data do not add to total shown because of independent rounding.

Table 9.—Number of industrial sand and gravel operations and processing plants in the United States in 1987, by geographic region

Geographic region	Mining operations on land				Dredging operations	Total active operations
	Stationary	Portable	Stationary and portable	No plants or unspecified		
Northeast:						
New England	4	--	--	1	--	5
Middle Atlantic	9	--	2	2	4	17
Midwest:						
East North Central	39	--	1	--	3	43
West North Central	8	--	--	--	3	11
South:						
South Atlantic	17	--	--	3	8	28
East South Central	10	--	--	1	3	14
West South Central	15	--	--	1	10	26
West:						
Mountain	6	1	--	--	1	8
Pacific	11	--	--	1	2	14
Total	119	1	3	9	34	166

Table 10.—Industrial sand and gravel sold or used by U.S. producers, by major use

Major use	Northeast			Midwest			South			West			U.S. total[1]		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
1987															
Sand:															
Glassmaking:															
Containers	1,344	$17,068	$12.70	1,980	$15,705	$7.93	2,906	$33,152	$11.41	2,095	$36,418	$17.38	8,326	$102,344	$12.29
Flat (plate and window)	W	W	13.05	842	7,511	8.92	1,096	12,293	11.23	W	W	14.97	2,156	22,821	10.58
Specialty	W	W	14.78	153	2,008	13.12	190	2,474	13.02	W	W	17.57	512	6,996	13.66
Fiberglass (unground)	W	W	9.41	216	2,054	9.51	153	1,731	11.31	W	W	15.97	538	6,005	11.16
Fiberglass (ground)	--	--	--	W	W	33.59	W	W	30.44	W	W	20.75	341	10,396	30.49
Foundry:															
Molding and core	523	6,963	13.31	4,804	42,642	8.88	1,217	12,436	10.22	129	2,186	16.95	6,673	64,227	9.62
Molding and core facings (ground)	W	W	W	--	--	--	--	--	--	--	--	--	W	W	W
Refractory	W	W	10.00	258	1,422	5.51	--	--	--	W	W	W	259	1,437	5.55
Metallurgical:															
Silicon carbide	--	--	--	130	831	6.39	--	--	--	--	--	--	130	831	6.39
Flux for metal smelting	--	--	--	W	W	8.93	W	W	1.88	77	2,319	30.12	114	2,593	22.75
Abrasives:															
Blasting	281	4,560	16.23	431	4,936	11.44	860	15,094	17.55	214	4,122	19.26	1,786	28,708	16.07
Scouring cleansers (ground)	W	W	33.00	W	W	24.41	W	W	40.50	--	--	--	62	1,563	25.21
Sawing and sanding	--	--	--	W	W	20.00	--	--	--	--	--	--	W	W	20.00
Chemicals (ground and unground)	W	W	13.31	W	W	12.86	222	3,618	16.30	W	W	14.58	513	7,438	14.50
Fillers (ground):															
Rubber, paint, putty, etc	W	W	39.05	71	3,087	43.48	46	4,378	95.17	W	W	18.38	147	8,470	57.62
Silica flour	W	W	18.29	221	6,488	29.36	W	W	25.05	--	--	--	247	7,098	28.72
Ceramic (ground):															
Pottery, brick, tile, etc	W	W	37.87	108	4,896	45.24	101	3,144	31.13	W	W	8.00	225	8,606	38.25
Filtration	226	2,953	13.07	49	738	15.06	153	2,126	13.90	6	172	28.67	433	5,989	13.83
Traction (engine)	W	W	9.09	299	2,391	8.00	132	1,325	10.04	W	W	12.09	465	4,081	8.78
Coal washing	--	--	--	W	W	12.00	W	W	4.00	--	--	--	45	228	5.07
Roofing granules and fillers	51	1,709	33.51	12	155	12.92	251	4,479	17.84	77	1,438	18.68	392	7,782	19.85
Hydraulic fracturing	W	W	W	1,014	19,584	19.31	375	6,968	18.58	W	W	26.43	1,395	26,743	19.16
Other uses, specified	525	7,748	14.76	466	6,733	19.32	451	11,049	24.50	480	8,244	17.18	XX	XX	XX
Other uses, unspecified[2]	31	794	25.61	270	3,525	13.06	1,596	16,676	10.45	245	5,277	21.54	2,142	26,273	12.27
Total[1] or average	2,982	41,797	14.02	11,824	124,740	11.02	9,747	130,943	13.43	3,324	60,178	18.10	27,377	357,657	13.06

See footnotes at end of table.

Table 10.—Industrial sand and gravel sold or used by U.S. producers, by major use —Continued

Major use	Northeast			Midwest			South			West			U.S. total[1]		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
1987—Continued															
Gravel: Metallurgical:															
Silicon, ferrosilicon	--	--	--	W	W	$10.00	W	W	$9.74	--	--	--	454	$4,436	$9.77
Filtration	9	$279	$31.00	W	W	W	W	W	7.42	--	--	--	W	W	16.86
Other uses	--	--	--	58	$686	11.88	W	W	12.06	58	$460	$7.93	W	W	10.43
Total[2] or average	9	279	31.00	123	1,339	10.89	441	$4,346	9.85	58	460	7.93	631	6,424	10.18
Grand total[1] or average	2,991	42,076	14.07	11,447	126,078	11.01	10,188	135,289	13.28	3,382	60,638	17.93	28,010	364,100	13.00

W Withheld to avoid disclosing company proprietary data; included with "Other uses, specified"; also included in "U.S. total" by use. XX Not applicable.
[1]Data may not add to totals shown because of independent rounding.
[2]Mostly estimated total production, plus other uses (small quantities) as reported by the producers.

Table 11.—Transportation of industrial sand and gravel in the United States in 1987 to site of first sale or use

Method of shipment	Quantity (thousand short tons)	Percent of total
Truck	17,470	63
Rail	9,562	34
Waterway	908	3
Not transported	72	--
Total	[1]28,010	100

[1]Data do not add to total shown because of independent rounding.

Table 12.—U.S. exports of industrial sand, by country

(Thousand short tons and thousand dollars)

Country	1986		1987	
	Quantity	F.a.s. value[1]	Quantity	F.a.s. value[1]
North America:				
Bahamas	(2)	40	1	18
Canada	713	9,224	600	8,638
Costa Rica	(2)	8	(2)	7
Dominican Republic	4	104	2	96
Leeward and Windward Islands	1	56	3	35
Mexico	63	1,708	50	1,388
Netherlands Antilles	8	106	8	174
Panama	13	254	8	273
Other	r2	r198	3	262
Total[3]	804	11,698	676	10,890
South America:				
Argentina	(2)	29	2	340
Chile	(2)	265	1	372
Colombia	(2)	132	1	174
Ecuador	(2)	100	(2)	97
Peru	1	124	1	135
Venezuela	3	159	6	341
Other	1	95	(2)	217
Total[3]	5	904	11	1,675
Europe:				
Belgium	7	778	17	1,176
France	(2)	182	(2)	198
Germany, Federal Republic of	1	425	8	874
Italy	3	145	3	531
Netherlands	3	1,164	6	1,722
Norway	(2)	8	(2)	37
United Kingdom	10	520	9	334
Yugoslavia	2	811	(2)	98
Other	2	776	3	551
Total[3]	28	4,809	52	5,522
Asia:				
Indonesia	1	256	(2)	8
Japan	2	835	6	770
Korea, Republic of	1	198	1	328
Singapore	1	286	5	888
Other	r1	r702	1	867
Total	6	2,277	13	2,361
Middle East and Africa:				
Saudi Arabia	(2)	16	(2)	7
South Africa, Republic of	2	10	3	344
United Arab Emirates	2	152	1	48
Other	r1	r277	1	152
Total	6	455	5	551
Oceania	1	220	1	253
Grand total[3]	849	20,363	758	21,253

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[1]Value of material at U.S. port of export; based on transaction price, including all charges incurred in placing material alongside ship.

[2]Less than 1/2 unit.

[3]Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census.

Table 13.—U.S. imports for consumption of industrial sand, by country

(Thousand short tons and thousand dollars)

Country	1986		1987	
	Quantity	C.i.f. value[1]	Quantity	C.i.f. value[1]
Antigua	28	173	54	134
Australia	22	387	18	407
Bahamas	--	--	19	30
Canada	3	87	6	51
Germany, Federal Republic of	--	--	6	365
Japan	23	27	--	--
United Kingdom	12	102	(2)	38
Other	(2)	238	1	45
Total	88	1,014	104	[3]1,071

[1]Value of material at U.S. port of entry; based on purchase price and includes all charges (except U.S. import duties) in bringing material from foreign country to alongside carrier.
[2]Less than 1/2 unit.
[3]Data do not add to total shown because of independent rounding.

Source: Bureau of the Census.

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